Rencana-Rencana/Articles

Accessing Information In An Information Society*

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Abstrak: *Di dalam sebuah masyarakat maklumat, teknologi baru diperlukan untuk mengakses secara berkesan sumber-sumber maklumat yang luas. Kepentingan dan unsur-unsur maklumat dibincangkan. Teknologi maklumat baru dan kaedah-kaedah mengakses maklumat digambarkan untuk membolehkan pengguna dalam masyarakat maklumat menggunakan maklumat secara positif.*

Abstract: *In an information society new technologies are required to efficiently access the vast information resources. The importance and elements of information are discussed. The new information technologies and methods of access to information are illustrated to enable users in the information society to make positive use of information.*

We are in the information era and all around us we are witnessing an information explosion. To locate a piece of information from the vast information resources, application of technology seems to be absolutely necessary today. In information access, 'technology is used to extend human capability. It can be used to compensate, remediate, amplify, and optimize'.[1] Thus, efficient access to information in an information society requires users to be in possession of adequate knowledge of information technologies, information handling environments, information resources, and methods of access.

What is an information society?

According to Daniel Bell, in the book entitled *Megatrends* by John Naisbitt, the post-industrial society is basically an information society. 'Information explosion' is the term used to describe the enormous amount of information generated by this information society.[2] For the first time the American economy is based on a so-called 'strategic resource'[3] which is not only renewable, but self-generating. For instance, between 6,000 and 7,000 scientific articles are published each day; scientific and technical information increases 13 percent per year and doubles every 5.5 years; and indeed information is likely to double every twenty months due to the increase in more powerful information systems and an increasing population of scientists.[4]

What is information?

According to *The Oxford English Dictionary*, information is 'Knowledge communicated concerning some particular fact, subject, or event; intelligence, news'. The location of toilets in a building is information, and 'Who in Kuala Lumpur made a million dollars but paid no income tax last year?' is also a piece of information. *Encyclopedia of Computer Science and Engineering* (Van Nostrand, 1983) notes that 'information is data which is used in decision-making'. This definition implies that information and decision making are closely related so that a piece of information may be extremely valuable in one decision but useless in another.[5]

Information in the electronic age may include all of the data, Information and knowledge that can be accessed and transmitted in electronic

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form, either video or computerized, and may consist of:[6]

a. The community information files that are generated by the community information system.
b. The online catalogues of all nonelectronic forms of information in libraries and information centres.
c. The electronic messaging system, which enables one to ask information and reference questions and to receive the answers via the same mode.
d. Files of data about the community, for example, demographic or consumer files.
e. Various electronic encyclopedias produced commercially.
f. A local online encyclopedia which organizes and indexes the questions asked and answered through the computer.

Importance of information

Each individual in our society needs information about education, employment, taxes, consumer protections, banking and financing, etc., and the list can go on depending on the individual. Anuar states that 'Our individual needs of information vary in relation to our stages and rates of development, economic and social circumstances, and roles and relationships in our family groups as well as in our larger social and working groups and the still larger groups we belong to as citizens of nations of the world'.[7] According to Jackson, the importance of information in the development of industries could be equal to that of financial or manpower resources.[8] Studies show that more than one half (59%) of the information users in the industrial sector in Indonesia needed scientific and technological information at least once a week and about one fourth of the users (26.3%) wanted their information immediately, but 40.3% of them could wait for their information for at least a week.[9]

Trade information is also extremely important to present-day society. For example, a joint-venture company comprising Malaysian, Taiwanese and Australian interests are planning to organize in Malaysia a database of market intelligence on Malaysia covering online services, product data, company credit information, market information and media coverage. The database will be available not only to bankers, manufacturers, importers, exporters, whole-salers, consultants and hotels but also the foreign investors in the country. Nigel Page, the managing director of FBR Database Inc., the Taiwan - based company specializing in market intelligence services, states 'Such specialized information will eventually filter through to potential investors from the European Community and the Japanese, for instance, who will be relocating their manufacturing operations to this part of the world'.[10] Information is also of vital importance to a government. For instance, to help the Malaysian government better formulate its industrial policy, The Asian Development Bank has recently provided a US$188,000 grant to Malaysia to establish an industrial sector database.[11]

Elements of access to information

Access to information requires attention to all these four elements namely legal, physical, affordable, and organized access. All these four elements must exist for total access and the absence of any one element may cause disruption to access. These elements may be defined as follows:[12]

a. Legal access means that one has the right to the information, whether established through laws such as the 'Sunshine Laws' or Freedom of Information Act, or by a transaction with the owner. Sunshine laws include those law making official meetings and records of most government agencies accessible to the public. To access information legally, a user must subscribe to an online information service or a database owner. The user will then be assigned an account number and a password to use the service.
b. Physical access means the ability to get to the information in whatever form is useful. Although online print copies are the quickest way of obtaining a search, sometimes, offline print option should be available. Downloading has become another option nowadays.
c. Affordable access means that the cost of obtaining the information is not greater than the value of the information.
d. Organized access means that the information and the sources of information are arranged in such a manner that finding the information does not make the cost prohibitive or time-consuming.

Modes of access to information

Today's technology offers the opportunity to increase access far beyond what has been achieved thus far. The increased use of computers, telecommunications, optical discs is changing our ways of access to information. Not too long ago, 'online' became a new term used in the information services, and since the mid-1980s CD-ROMS (Compact Disc Read-Only-Memory) has become the foundation for a major revolution in the storage and delivery of textual information. Thus, online and CD-ROMS are the two very important modes of access to information.

a. Online Searches:

Online simply means that a user is directly in communication with the computer, just as one would be when talking to someone on the telephone. Therefore, online information services consist of the following six components:[13]

1. Electronic data compilation -- databases are created by a computer to be retrieved through online services systems.
2. Computer timesharing -- many users can share the processing time simultaneously.
3. Random-access storage devices – databases are stored on magnetic disks so that items of information can be scanned at very high speed.
4. Interactive information retrieval software -- computer programs will allow users to actively communicate with the databases by entering commands.
5. Data telecommunications -- data must be transmitted by telephone systems between the user's terminal and the host computer.
6. Computer terminals -- devices for sending and receiving information to and from the computer. They consist of a keyboard and data displayer.

Incorporating the above components, the whole data communication process always involves the following five basic steps:[14]

1. Information input: enter information into a transmitting device such as the keyboard of a computer terminal which will convert the input into a stream of digital pulses of electricity representing the characters of information using ASCII (American Standard Code for Information Exchange) codes.
2. Signal modulation: the information, after the conversion, is in a digital mode (a discrete unit) so that it must be converted or modified to an analog mode in order to be transmitted by normal telephone lines. A modem (modulator-demodulator) is used to convert the signals for transmission. The modem will change the digital data signals generated by the transmitting devices (computer terminals) to audio signals for transmission over voice-carrying telephone lines.
3. Information transmission: information is transmitted from the databases to the users over the communication links or channels. Two common types of links or channels are used for data communication namely dial-up or public-switched lines and private or leased lines. The ordinary telephone line is the best example of a dial-up facility. A data communications system can be easily established wherever a telephone is located. A private or leased line meanwhile requires a lease and remains connected for the duration of a lease. It provides unlimited use of the facility and better quality of transmission.

The ability of a channel to transmit information is usually measured in terms of bits per second (bps), which is roughly the equivalent to the baud rate. Baud rate is a measure of transmission of electrical signals and is named after a Frenchman, Baudot who was a pioneer in the development of the telegraph. The most common speeds are 30 and 120 characters per second, referred to as 300 and 1200 baud.[15] While transmission speed can range from 300 to 9600 bps, 'libraries are accustomed to transmitting and receiving data at a speed of 1200 bits per second when using services like BRS (Bibliographic Retrieval Services) and DIALOG. Transmission over optical fiber generally occurs at a rate of 90 million bits per second or greater. At this speed, the full text of a 30-volume encyclopedia could be transmitted over a distance of 25 miles in less than six seconds'.[16]

Fujitsu Ltd. of Japan has begun exporting optical fiber transmission devices to MCI Communication Corp. in the United States. These new devices can transmit 1.8 gigabits (1.8 billion bits) of information per second, which will make the MCI system the fastest in the world. With a capacity of 1.7 gigabits American Telegraph and Telephone currently operates the fastest system.[17]

4. Signal demodulation: at the other end of the communication link, the audio signals transmitted over the voice-carrying telephone line must be converted or modified back to digital form by another modem before the computer terminal can accept and process the information.
5. Information output: information as output in the data communications system is received by the computer terminal.

Now, the question is 'where can a user get online services?' Owning a PC, a modem, a communication software, and a printer how should the user start? The answer is 'What kind of information does the user need?' or more specifically, 'Which database would he/she like to search?' As of spring 1984, there were more than 2,000 online databases offered for public use by about 275 online commercial retrieval services worldwide.[18] Some of the most popular and easy-to-use online information services can be categorized into four types:[19]

1. Popular information utilities: include services like CompuServe, Dow Jones News/Retrieval and The Source. Dow Jones News/Retrieval Service's database consists of items appearing on the Dow Jones News Wire, in the *Wall Street Journal,* and in Barron's magazine. Users can obtain up-to-the-minute stock quotes and business and financial news from these sources. Compu-Serve Information Service and The Source offer electronic mail, bulletin boards for exchange of hobby information and computer programming online as well as news and business information. Dow Jones aims at the financial information consumers while CompuServe and The Source serve the home users.
2. Full-text retrieval services: include Mead Data Central (MDC) and NewsNet Service. The former's NEXIS incorporates the full text of news stories from several major wire services and periodicals, while the latter contains the full text of more than 100 newsletters produced by various organizations in the United States.
3. Library research services: designed to simplify and vastly reduce the research time, these services index and identify published literature in every form on every topic. DIALOG Information Services is a leader in the social sciences, humanities, and arts, while Bibliographic Retrieval Services (BRS) leads in specialized databases in the education field such as bilingual, exceptional child, and vocational education. Systems Development Corporation (SDC) ORBIT Infoline (changed to Pergamon ORBIT Infoline in 1987) is a service specializing in scientific databases such as chemical, engineering, rubber, plastic, packaging, etc.
4. Numeric data services: include economic time series and forecasts, financial balance sheets and income statements, and other number series. The major companies are ADP Network Services and I.P. Sharp Associates. I.P. Sharp provides economic databases and econometric modeling and forecasting programs used by academic, banking, governmental, manufacturing, and retailing organizations. The numeric data are mostly 'in the form of time series, measurement variables taken at specified interval over given periods (e.g., values for wine exports from France to the United States, 1980-84)'.[20]

Among the major American online information services, DIALOG, BRS, SDC, MDC and Medline dominate the field, and 'account for 98 percent of the revenue and 96.5 percent of the use' of the 250 most-used databases. Actually, DIALOG and MDC alone account for 81.8 percent of the revenue and 68.56 percent of the usage.[21]

Online searches are not free. The costs are made up of a number of variables. In addition to the basic cost of a telephone line, some major elements are connect hour charges, citation charges, and telecommunication costs. Some vendors demand additional service charges. For example, users have to pay a US$50 administrative charge for open access to BRS (Bibliographic Retrieval Services), while DIALOG now charges US$25 a year for maintaining the standard service agreement. [22] In Kuala Lumpur, subscription for Lawsearch is M$1,200 per year with a 30 cents-per-minute connect-time charge (offset against a M$500 deposit).

Currency is one of the major advantages of online searches. For example, The *New York Times Index* database may be updated daily and weekly online. Users may be able to have access to the database online only four hours after the actual news occurred, rather than waiting for two to three

months for a printed version. It is even faster in today's business world. 'Online information services can help you keep up with what's happening in the business world almost as it occurs. News and stock exchange wires, for example, appear online within 15 to 90 minutes'.[23]

b. **CD-ROMS :**

After quoting all the costs of online searches you may wonder what sort of library profession I am in. Don't all libraries provide free services? How about the third element of access to information which was mentioned earlier? 'Affordable access' means the cost of obtaining the information is not greater than the value of the information. If I have a term paper or conference paper due tomorrow, every piece of information related to the topic of my paper is valuable. However, the telecommunications costs are on the rise so that the cost of my searches could be very high. I could possibly access the same information directly and eliminate the middle persons and vendors. Such an alternative is a new mass data storage technology called CD-ROM.

The storage compacity of a compact disc is phenomenal. A single 4.72-inch disc stores 550 megabytes of data, the equivalent of 1500 floppy disks or 28 units of 20-megabyte hard disks. That's 250,000 pages or 500 books, or whole encyclopedias.[24] Doing it manually, one secretary, typing 90 words per minute, has to work 8 hours per day for 8 years. For online searchers, 'one tiny CD-ROM can hold 46 entire day's worth of continuous online information transmitted at 1200 baud'.[25]

Speed is another strength of CD-ROM; any piece of information on the disc can be located and displayed within two or three seconds. 'In one second the drive can read 75 blocks or 150K bytes of user information'.[26]

There is already at least one whole encyclopedia (all 20 volumes worth) on a compact disc -- The *Academic American Encyclopedia* by Grolier, which contains 9 million words under more than 30,000 articles. The disc includes over 110 megabytes of text and indexing, and costs only US$299. Incidentally, we should be able to store 5 sets of this encyclopedia on a single disc (550 megabytes).

Many online databases are now also available on CD-ROM format. For example, ERIC of DIALOG has been a very popular and inexpensive online database and is now available on CD-ROM. Compact Disclosure contains business and financial information extracted from reports produced by public companies; PsycLit is a bibliographic database compiled from *Psychological Abstracts. Dissertation Abstracts* and *Newspaper Abstracts* are also available on disc. The H.W. Wilson Company has already published its twelve indexes in CD-ROM format and named Wilsondics. Even Bowker's *Books in Print* is on a compact disc.

CD-ROM information can only be accessed by a CD-ROM drive connected to a microcomputer. Thus, the actual costs include hardware and software costs. Hardware costs for one workstation is about US$7,000 including CD-ROM drive, microcomputer, monitor, and printer. Software costs of CD-ROM vary according to the ownership of the software -- nonsubscription vs. subscription. Nonsubscription by definition means that the purchasing library or individual will own the CD-ROM outright once it is purchased. You can buy the Grolier's *The Electronic Encyclopedia* for US$299 and own it; you also can purchase a set of *Kirk-Othmer Encyclopedia of Chemical Technology* by Wiley in the same manner. However, CD-ROM is typically on a subscription-lease arrangement -- libraries purchase only permission to use a CD-ROM database, not the discs themselves. Under this arrangement, if a current subscription is cancelled, all discs must be returned to the publisher. Thus, subscribers will no longer have access to retrospective information on disc if they cancel their current subscription. Most of the major CD-ROM indexes operate this way, but there are exceptions. For example, when an updated Wilsondisc is received by a subscribing library, the library may give the old disc to a branch or another library (but they may not sell it). Public Affairs Information Service (PAIS) will allow the library to keep the last disc received if the current subscription is cancelled.[27] The annual subscription fees of some selected CD-ROM databases are as follows:

BiblioFile:	US$ 870
Compact Disclosure: Not-for-profit organization rate:	US$3,200
Commercial rate:	US$4,500
ERIC:	US$1,995

Wilsondisc: Readers' Guide to Periodical Literature:	US$1,095
Index to Legal Periodicals:	US$1,495
Social Science Index:	US$1,295

In conclusion, even though precise prediction of societal trends are difficult, it is still believed that technology will continue to affect people's lifestyles, and that access to information will be a key variable in people's ability to solve problems, to form a better society, and even to survive. Because of the importance of information in an information society, it is imperative to apply technologies to access the vast information resources for positive purposes.

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Editor's note: Dr. George W. Huang will complete his visiting professorship in the University of Malaya on 25 April 1989. He will return to the Department of Education, University of California (Chico), U.S.A.